The phallic Complex of *Poekilocerus Pictus* (Fabr.) (Pyrgomorphidae; Acridoidae; Orthoptera)

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INTRODUCTION

Acridoid grasshoppers of the family Pyrgomorphidae are widely distributed in the tropical and sub-tropical regions of the world. The taxonomy of this family was revised on the basis of its phallic structures by Kevan (1959; 1964), Dirsh (1956; 1961) and Akbar (1963). The external anatomy of *Poekilocerus pictus* was studied in detail by Latif et al. (1959). As their study on the structure of the male genitalia was not comprehensive, it was considered necessary to put forward a detailed account of the phallic complex in *P. pictus*.

MATERIALS AND METHODS

The grasshoppers were collected and preserved in 70% alcohol. For extraction of the phallus, the insect was held between the thumb and the index finger. A sharp needle was then inserted into the genital chamber by depressing the sub-genital plate and raising the epiproct. The adjoining muscles were slowly detached and the entire phallus was drawn out. The sub-genital plate was pushed back and the specimen was left for use in other morphological studies. The phallus was then heated in 10% KOH for loosening of the muscles and membranes. The components of the phallic complex, *viz.* the ectophallus, the epiphallus and the endophallus were separated and stored in vials of 70% alcohol for future reference. Before storage the structures were drawn using a camera lucida or an ocular grid.

STRUCTURE OF THE MALE GENITALIA

The phallus when extracted from the genital chamber is capsule shaped and brownish-yellow in color. It is bounded dorsally by the epiproct (EP), laterally by the paraprocts (PR), ventrally by the pallium (PL) and externally on the ventro-lateral side by the sub-genital plate. The phallic complex in *P. pictus* may be customarily divided into an epiphallus, ectophallus and endopallus.

Epiphallus: The epiphallus lies at the antero-dorsal end of the phallus and may be considered as having an auxiliary function. It is attached

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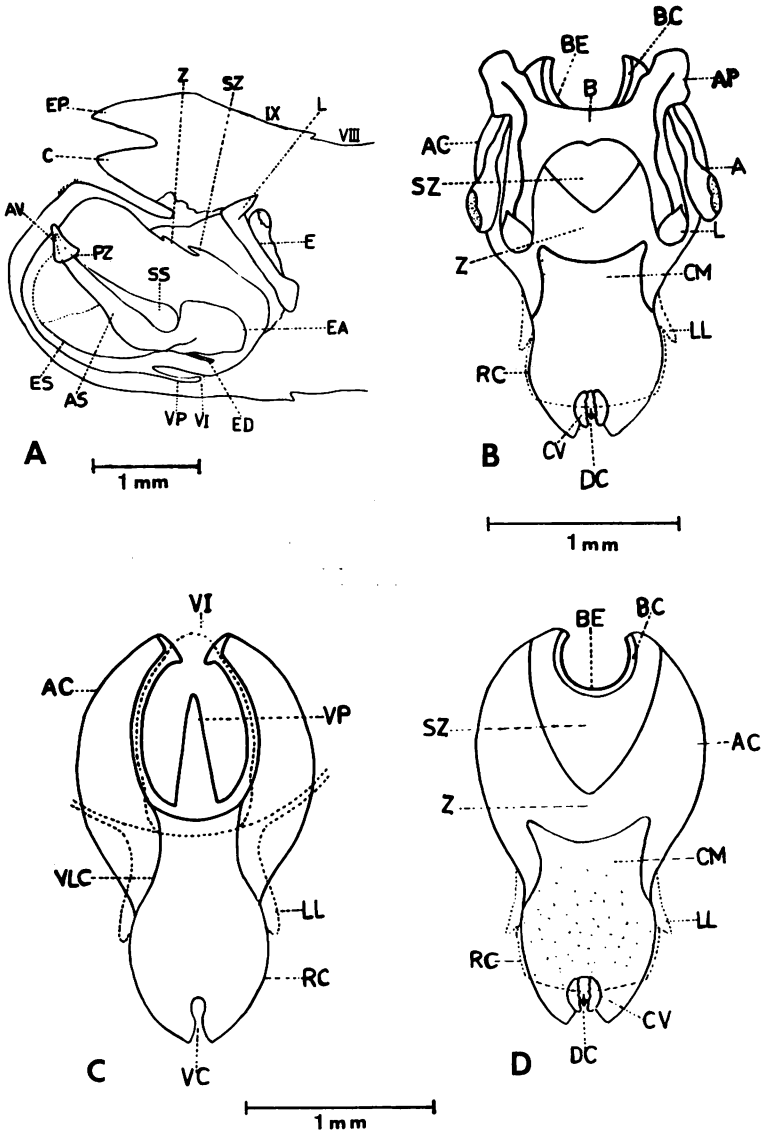

FIG. 1. *The phallic structures of* Poekilocerus pictus *(Fabr.). A, Transverse section through the genital segments; B, Phallus, dorsal; C, D., Ectophallus, ventral and dorsal.* A, *appendices of epiphallus; AC, apodemes of cingulum; AE, aedeagus; AP, anterior projections of E; AS, aedeagal sclerite; AV, aedeagal valves;* B, *bridge of E; BE, basal emargination; BC, basal thickening of cingulum; BF, basal fold; CM, central membrane; CV, valves of cingulum; DC, dorsal cleft; E, epiphallus; EA, endophallic apodemes; ES, ejaculatory sac; G, gonopore; L, lophi; LL, lateral lobes; LP, lateral plates of E; P, phallotreme; RC, rami of the cingulum; SS, spermatophore sac; SZ, supra-zygomal plate; VC, ventral cleft; VI, ventral infold; VP, ventral process; VLC, ventral longitudinal cleft; Z, zygoma.*

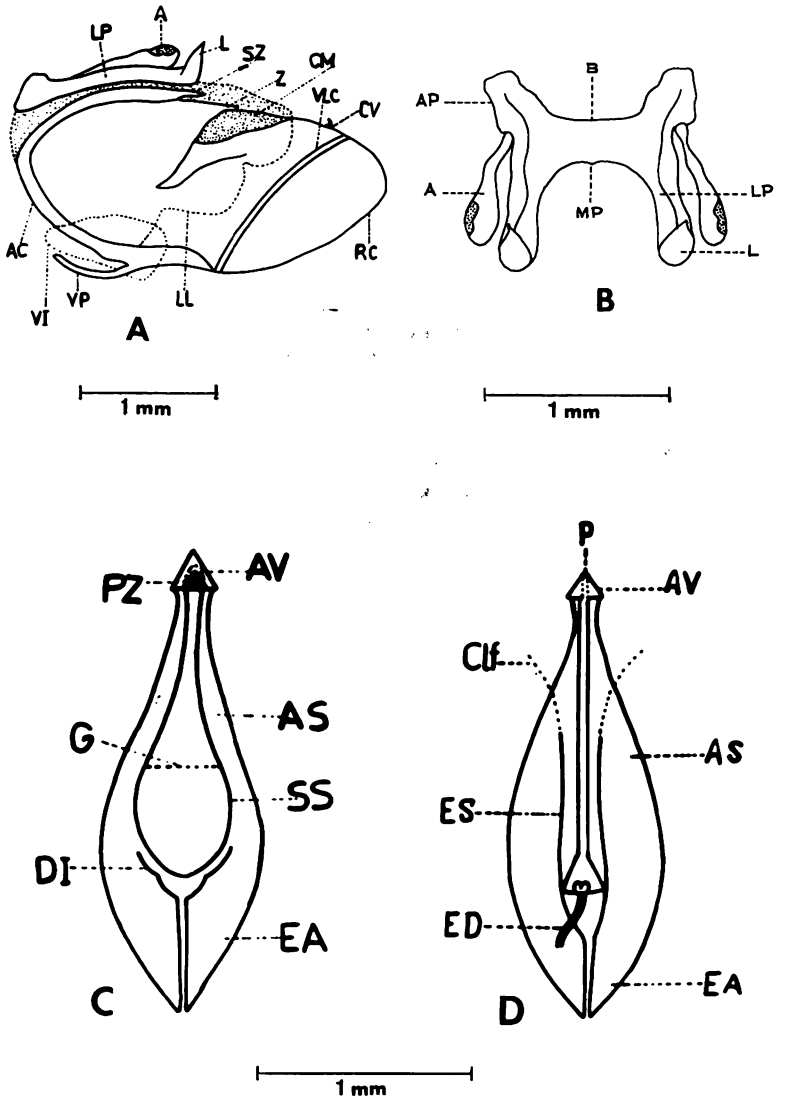

FIG. 2. A, *Phallic complex, lateral;* B, *epiphallus;* C, D, *Endophallus, dorsal and ventral. Lettering same as in Fig.* 1.

to the dorsolateral boundaries of the cingulum by means of the ectophallic membrane (EM). The epiphallus is "bridge-shaped" as in other species of Pyrgomorphidae, the bridge (B) links the two lateral plates (LP), and bears the median process (MP) on the posterior surface. The anterior process (AP) is large and is at a higher level than the bridge, thereby giving the epiphallus the shape of a hanging bridge. At the posterior

aspect of the lateral plates are the hooked lophi (L) which are synonymous with the posterior projections (Akbar, 1965). The lophi are triangular in shape and serve to depress the sub-genital plate of the female during copulation.

The dorso-lateral appendices (A) are borne on the proximal end of the lateral plates. They are charcteristic of the family Pyrgomorphidae and according to Akbar (1963) are homologous to the oval sclerites of the generalized acridoid epiphallus.

Ectophallus: The ectophallus is the outer cover of the endophallus and is of a highly specialized type as there is a definite distinction between the ectophallic membrane and the cingulum. The ectophallic membrane (EM) is double layered and has an outer thick and an inner thin membrane. The inner membrane is attached to the zygoma (Z) and rami (RC) partially covering the valves of the cingulum (CV). The outer thick membrane covers the cingulum and extends up to the epiphallus.

The ectophallic membrane is seen to form the basal fold (BF), the lateral lobes (LL) and the ventral infold (VI). The central membrane (CM) is bounded by the rami (RC) and Zygoma (Z) on the dorsal surface of the distal half of the cingulum. The cingulum is bulb-shaped, the broad portion representing the apodemes (AC) the neck representing the rami (RC) and the zygoma lies in between as an intermediate sclerite. Akbar (1965) points out that the apodemes and zygoma do not follow the generalized plan in *P. pictus*. The apodemes are joined together by the supra-zygomal plate (SZ) which bears the basal thickening of the cingulum (BC) and the basal emargination (BE).

The rami (RC) consist of two parts, a small dorsal supra-ramus (SR) and a large ventral ramus. Ventral longitudinal ridges are present on both the dorsal (DC) and ventral (VC) clefts. The psuedoarch (PZ) is in the region of the aedeagal valves (AV) and extends up to the cingulum. The valves of the cingulum (CV) are present on the dorsal region of the rami. Akbar (1965) considers that the ventral valves (Latif et al. 1959) occupy a dorsal position. The zygoma consists of a large supra-zygomal plate (SZ) and the zygoma (Z).

Endophallus: The endophallus consists of the broad endophallic apodemes (EA) and the heavily sclerotized aedeagal sclerites (AS) which has the aedeagal valves at its distal end. The ejaculatory sac (ES) and the spermatophore sac (SS) are transluscent and separated from one another by the aedeagal sclerites. The ejaculatory sac is of the 'open type' and thus belongs to the "Chasmosacci" type of Roberts (1941). The opening through which the spermatophores exude is the false gonopore or phallotreme (P) which is slit-like. The spermatophores are ejected by the pumping mechanism of the spermatophore sac.

The endophallus is the main intromittent organ and can be extended and retracted. The endophallic apodemes (EA) are paired sclerites lying

at the anterior end of the endophallus. They bear a pair of inflections on the dorsal side known as the dorsal inflections of the endophallic apodemes (DI). The aedeagal sclerites are rod-like, while the aedegal valves are feebly sclerotized. The aedeagal valves are inclined upwards to form a small process the psuedoarch (PZ) which is joined dorsally with the valves of the cingulum.

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